

P. E. M. Leith
Nov. 1952

ENERGY!

— for —

Breakfast



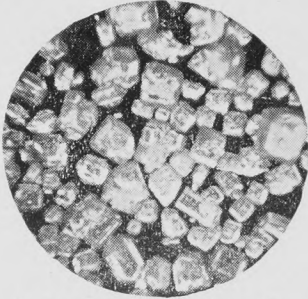
A Story of

Pure Alberta SUGAR

From Alberta Farms to Canadian Homes



Story of The



Sugar is a Crystalline Pure Carbohydrate made in various grains. Fine grains shown by Microphoto.

SUGAR

Beet Industry



These samples show the clear crystals of Pure Alberta Sugar — Medium grain by Microphoto.

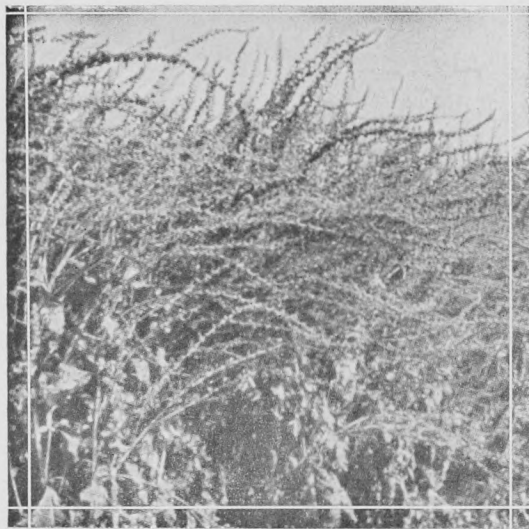
This is the story of the Sugar Beet in Alberta. It is a story filled with romance and picture, a story that has developed only because of clear thinking, hard endeavor and ceaseless toil.

WHAT SUGAR IS

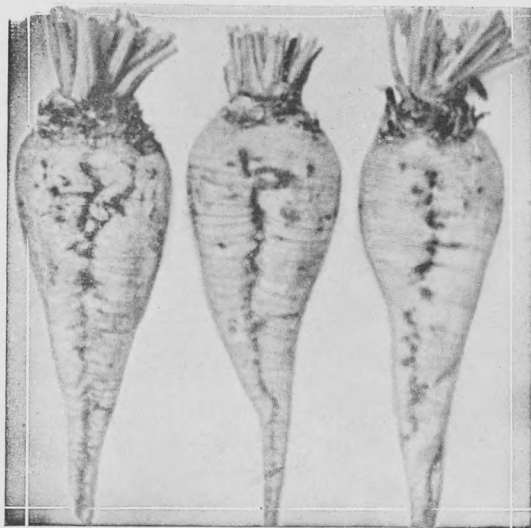
In the first place we must understand what sugar is. The chemists of the world call it sucrose. This is their name for a certain combination of carbon, hydrogen, and oxygen, $C_{12} H_{22} O_{11}$. All of the sugar we use on the table, whether it comes from cane, beets, or watermelons, is exactly the same thing—sucrose. This sugar, or sucrose, is not made by man. It is produced by the plants themselves out of the soil, the pure air, the sunshine and water. All man can do is to extract this sugar from the plants, which have already spent months in patient growth in order to make it. And these plants have made a food that is a perfect source of pep and quick energy. Energy with which to think, work, and play. It is a food that makes possible all of our sweet jams and jellies, desserts, preserved fruits, candy, ice-cream, and hundreds of the nicer things we have to eat. Just think how stale our food would be if we did not have sugar to sweeten it!

HOW MAN CAME TO USE SUGAR

In days so long ago that no man can say just when, the people of the world did not have sugar to eat. Whatever sweetness they had in their food came from the use of honey. But after a number of years, in the far off East, man discovered a plant that is now called sugar cane. This plant was sweet to chew upon, and it was highly prized. However, the small white crystals that we know as sugar today, were not made until the time of Queen Elizabeth of England. Then man began to grow the sugar cane in far off southern climes, and employed dark-skinned natives to labor in the fields. The sugar was transported to the countries of the world in sailing ships, and the cost of sugar was high.



The Seed of the Sugar Beet Plant.



Sugar Beets Topped. The Source of All Pure Alberta Sugar.

BEET SUGAR

The sugar beet has also been known for a long time. It was some time though, before the fact that there was sugar in it became known. This was discovered by a man named Marggraf. Not many people paid attention to this discovery until the cost of sugar from the cane plantations became more than people could pay. Then they began to look for other places to obtain their sugar supply. The Emperor Napoleon in France was the person who gave the sugar beet its first real start in life. France at the time was surrounded by enemies, and so Napoleon encouraged the building of sugar beet factories, in order that France might still be able to have sugar. From that time on, the sugar beet industry has grown by leaps and bounds.

Today beets are grown in Russia, Germany, France, England, United States, Canada, and many other northern countries. Sugar cane is only grown in the south, on plantations, from whence it is shipped to sugar cane refineries.

After the establishment of the beet sugar factories in the United States, people began to look for other places on this continent where the valuable plant could be cultivated. And they found an ideal place when they saw Southern Alberta. For here was just the right soil, an abundance of sunshine, and a man-made water system that could quench the sugar beet's thirst. And so in 1925, the first harvest of the sugar-filled plants was completed, and from the new factory at Raymond, after months of anxious work and toil, the first gleaming crystals of Pure Alberta Sugar were sacked and shipped for the use of Western Canada.



Land Preparation for Sugar Beets.

THE SUGAR BEET

The sugar beet is quite a different plant from its cousin, the garden beet. For it has a long tapering silver white root, in place of the table beet's red root. In some cases the tap root of the beet goes six feet into the soil and feeding roots in all directions. It is easy to understand how valuable this is to the fields on which it is grown. Above ground, spreading in straight rows, are the broad, vivid green leaves of the plant. They look very healthy, and quite beautiful when they are all together in a huge field, like a green carpet that Nature has flung far and wide. The beets are very tiny plants in the spring, but after receiving careful attention, much water, and all of the ripeness of the summer, they come to be large and heavy, so that an acre of them may weigh as much as 20 tons or even more!

Beets have a long history behind their development. They have been cultivated and bred for improvement for two hundred years. A good beet today has eighteen per cent sugar, whereas its distant ancestors had only four.

HOW IT IS GROWN

It is no wonder then that the farmer takes such care to prepare his land in just the right way, before he plants the beet seed in it. Most of the land is plowed in the fall, so that it can absorb the winter snows and moisture. In the spring, the land is carefully disced and harrowed. Some farmers also use a leveller on their land. It is a machine for filling in all the little hollows and removing all the little hills, so that a later process, irrigation,



Plowing and Packing the Soil.



Drilling the Seed.

can be carried out with less work. The seed bed when ready, is level, and the soil upon it is very finely divided. And underneath the surface there are the many minerals and stored water that will be needed by the young plant for the making of sugar. To make sure that these minerals are there, the farmer grows different crops on the same piece of ground. This is known as rotation. The different plants on the soil need different minerals for their growth, and they also put back into the soil their own particular unused minerals, so that by using several plants on the same soil, it is not robbed of its richness. Beets also require artificial fertilizer in some cases, or barn yard manure. The farmer does all these things before the beet seed is planted, in order that it may grow in a soil teeming with life, and eager to help the beet in all that it has to do.

SEEDING AND THINNING

Now comes the time for seeding, which takes place from the tenth of April to the fifteenth of May. Seeding, or drilling, as it is called, is done by a clever machine known as a drill. By using it the farmer can plant from four to eight rows at a time, and he knows that the seeds will be down just low enough, and will be thick enough for a good stand. The sugar beet seed, which looks like table beet seed, is placed in cans on the machine, which is then driven along the field. The seeds are planted automatically in the ground at a depth of a little over an inch with the needed fertilizer.

Now that the seeds are in their specially prepared bed, they begin to grow, and if everything works out all right they will begin to show through the



Cultivating.



Irrigating.

ground in about two weeks time. This is an anxious time in their life. If a wind should come they might be blown out of the ground, and if cut-worms attack them they would be a sorry looking field of beets. Usually, though, the sun shines, and there are few worms, so that the time comes for them to be thinned and blocked. When the beets first come up, they are very thick and very close together. They could never grow very big like that. So the farmer and his helpers cut out the beets in the rows and leave a little cluster of plants every twelve inches. This is called blocking. From all of these clusters are taken the weakest plants, and one alone remains. This is the thinning, and it gives each beet lots of room and water for its growth.

IRRIGATION

The farmer's work has now just begun. No weeds must be allowed to grow with the beets, and the soil must always be loose and fine. For these reasons the workers cultivate the fields all through the summer. In Alberta, there is not enough rain in the summer for sugar beets, and so ditches of water must be turned on the fields for irrigation.

Irrigation is a very interesting thing to watch. First of all, between the rows of beets are dug small ditches, or furrows. Then from the canal or main source of water, a stream is turned into these furrows. The stream runs from one end of the row to the other, soaking into the ground and bringing the beets the needed water. You can imagine how pretty it must be. Long rows of water looking like silver ribbons that stretch over a vivid green field as far as the eye can see.



Topping and Loading



Thinning Beets

The farmer who grows the beets must be a patient and a wise man. For to grow beets, one must know many things. Beet growers are almost all good farmers. They must continually hoe out the weeds and loosen the soil in the furrows. They have to irrigate when there is no rain, and they nurture the plants with all the care and patience they have.

The sun and the soil do their part too. The beet is given everything it needs so that it can make all the sugar possible, and store it away in its big white root.

HARVEST TIME

At last, late in September, with the first frosts in the air, harvest time comes. The farmer loosens the beets in the rows with a lifter, and beet workers move down the rows like machines themselves, pulling the beets out of the ground, knocking them together to shake off the dirt, and then cutting off their leaves with one flashing motion of the gleaming beet knives. It is a colorful sight. Since the war, machines have been invented to top beets—windrow them and the leaves, and load them into trucks. Mechanization of beet growing is spreading very rapidly.

The beets when loaded into trucks or wagons are taken either directly to the factory or to loading stations. From the loading stations they are taken to the factory by train.



Beet Storage.



Sugar Beets.

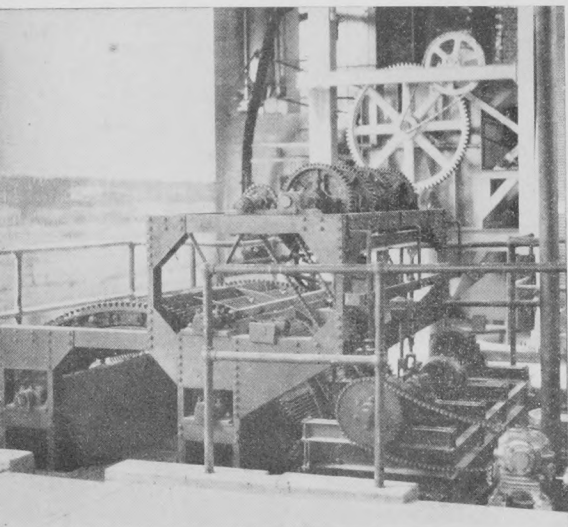
The noble beet has now completed its duties. It has stored up sunshine and water, and converted them into sugar. For months it has grown and ripened. Now it has left the ground and will yield its treasure of sweetness to man.

FROM SUGAR BEET TO SUGAR

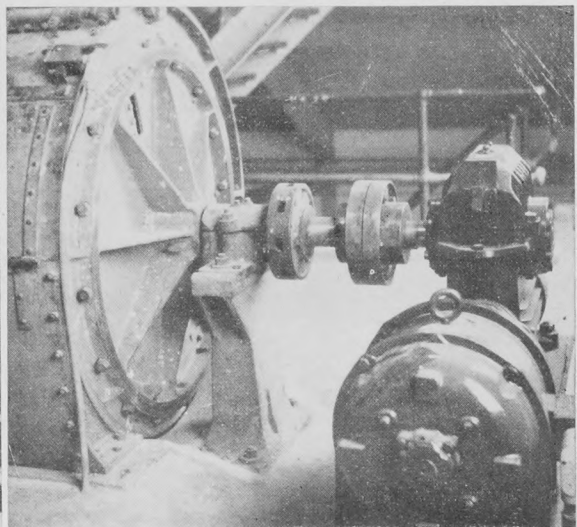
A sugar beet factory is a large place. Several million dollars are spent to make one. There must be lots of fuel for its boilers, and lots of water for the steam. Offices have to be built, chemical laboratories must be maintained, and many men employed. All of this is done so that we might have pure and inexpensive sugar.

The factory is divided into two parts. They are called the "beet end" and the "sugar end." The beet that we will follow through the factory starts its journey at the beet end. If it is not delayed in the piles for storage, our beet will have gone through the entire process and emerged as sugar, pulp and molasses in not more than 28 hours!

The beets come into the factory by wagon, truck and train. Each load is weighed, tested for sugar content, and "tared." "Taring" determines how much dirt is on the beet. This weight is deducted from the total weight of the load and the farmer is paid accordingly. The loads are dumped automatically by machines and conveyed by belts to the huge storage piles. These piles cover acres and contain 60,000 tons of beets or more at each factory.



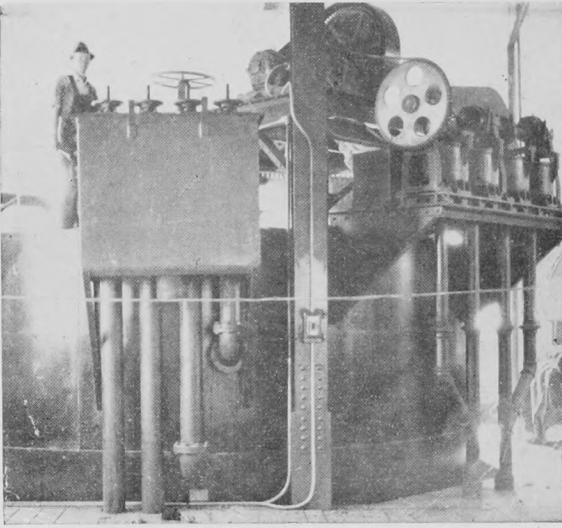
Washers.



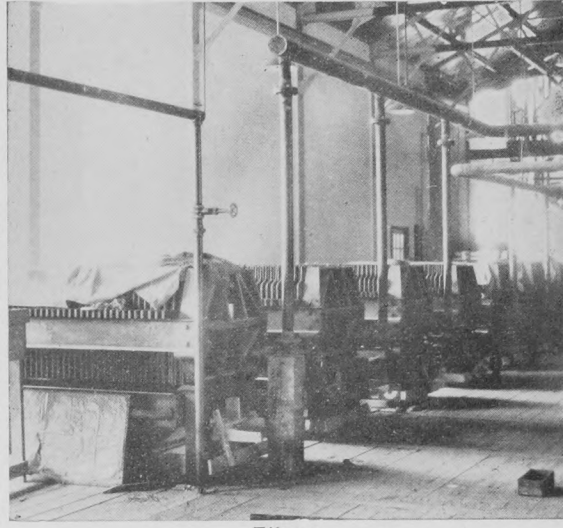
Slicers.

WASHING AND SLICING

Along with others our beet is knocked into a flume or ditch, filled with fast running water, and carried thus from the piles to the factory building. First the sugar beet is lifted by a huge beet wheel from the flume to the beet washer. Here the beet goes through a huge washing tank until it is spotlessly clean. From its bath it is lifted to the weighing machine, which automatically records the weight of all beets poured into it. From the weigher our beet is dropped into the slicer, where thousands of razor-sharp knives slice it into noodle-like shreds called cossettes. It is now all warm and steamy, greyish white in color, and is moved along a belt to huge tanks, the diffusion battery, where all the sugar is soaked from it. The process used in diffusing sugar juices from a beet is similar to that used in steeping tea. The shreds of sliced beets are steeped with hot water, under heavy pressure, as high as 50 lbs to the square inch. The sugar diffuses from the cell of the beet into the water, which is drawn off after soaking about an hour in each separate tank of the battery. There are two products resulting from this: the pulp and the juice. The pulp goes through a pipe to an outside pit, and is used as an excellent cattle feed. Diffusion juice as it is now called is pumped through measuring tanks, looking somewhat like ink, and then to the carbonators.



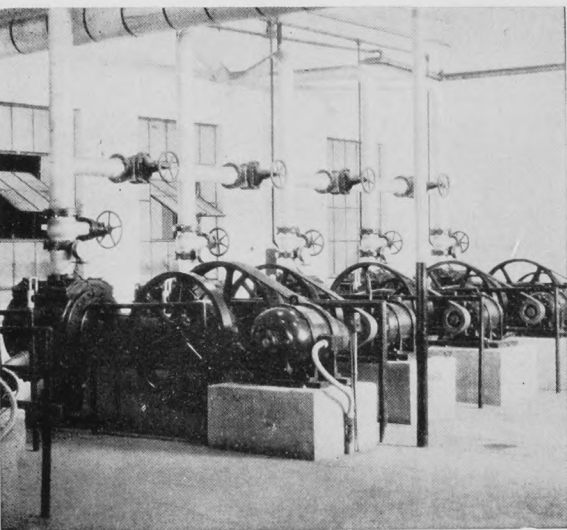
Thickeners.



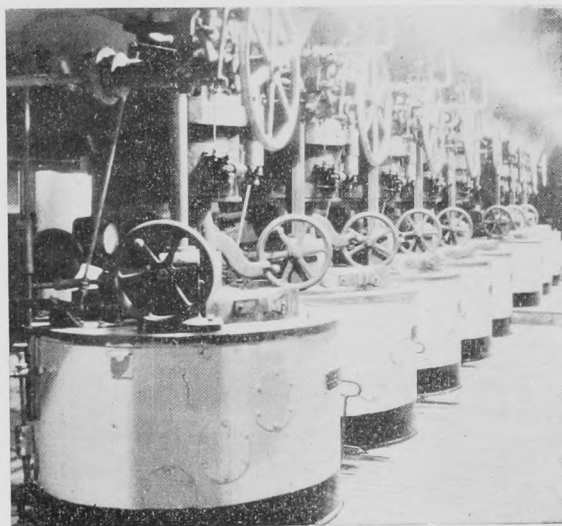
Filters.

PURIFICATION

The juice, heated to boiling, now has to undergo several complicated chemical processes. It enters the carbonators, which are tremendous tanks, into which both carbonate of lime and CO_2 gas are admitted. Lime is passed through the juice. The lime acts as a purifier, and condenses some of the impurities in the juice. Now, in order to be rid of the lime, carbon dioxide, the gas we breathe out of our lungs, is passed through the juice. This results in lime-cake, which is certainly nothing like chocolate cake. The juice is now passed through filter after filter, and sulphured, until there is not the slightest particle of any impurity in it. Now we have to get rid of much water, so the juice is boiled in huge evaporator tanks that are very hot. These evaporators are similar to the kettles on your stove, but in order to have a great boiling surface, they are built with thousands of tubes from $\frac{3}{4}$ " to $1\frac{1}{4}$ " in diameter. These tubes hold hot steam, and the juice is boiled all around them. At first this boiling is done under pressure, but to save steam and coal, the vapors from the first body are taken to boil the second one, and so drawn by vacuum that there are five bodies boiling juice from one admission of steam. From the evaporators the syrups are very heavy and will soon turn into sugar, so what is left of our beet travels next to a vacuum pan, where it is boiled again, until tiny crystals, that look like wee diamonds, begin to form. The juice is said to have crystallized.



Filter Pumps.



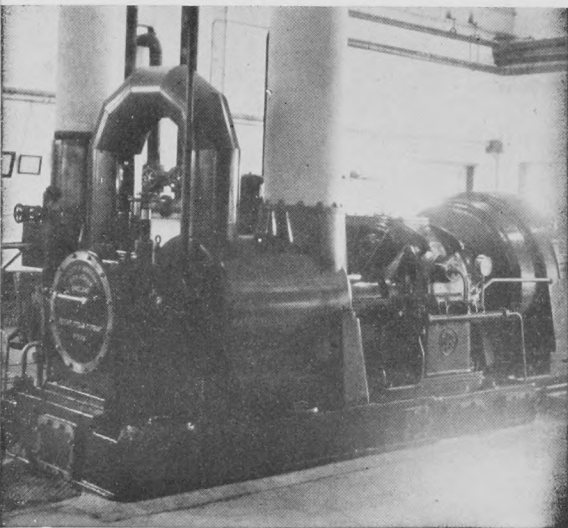
Centrifugals.

CRYSTALLIZATION

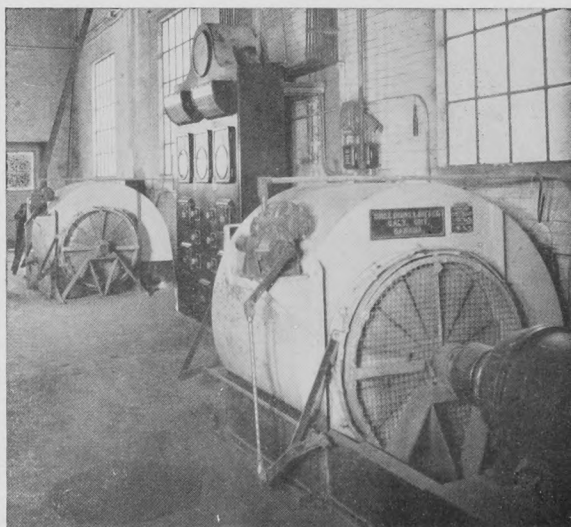
But there is yet a lot of syrup around the crystals that we must get rid of. The liquid is poured into a large centrifugal drum that is attached to a motor. The drum can be revolved at a very high speed. On the inside of the centrifugal there is a lining of brass screen. When the boiled syrup is placed on the centrifugal and whirled, all of the unwanted molasses disappears through the screen, and the gleaming white crystals remain. Warm water is played on them to wash them clean. When you watch this process you can see the material in the centrifugal change from brown to white right before your eyes. From the centrifugal the sugar is moved to a dryer, that evaporates all the water from around the sugar crystals by a stream of warm dry air. You could not stay in this machine for a minute, because it is so very hot. The sugar is next cooled.

Now it is ready to be sorted into sizes. To do this it is passed over screens. Large crystals, medium crystals, and fine crystals are sorted and sacked. The sacking machine weighs out exactly the right weight, and the sewing machine seals the bag against all outside dirt. In the bag is the sugar that our beet contained not so very long ago.

Thousands and thousands of bags are stored in the large warehouses, and there is more sugar stored in huge air conditioned, spotless concrete bins. From the factory the sugar at last is ready to be shipped by fast trains to all parts of the west. In the grocery store where you have gone for your recall just how long and how interesting this sugar's journey has been. mother, the Pure Alberta Sugar is ready, and as you take it home you can



Steam Turbine.



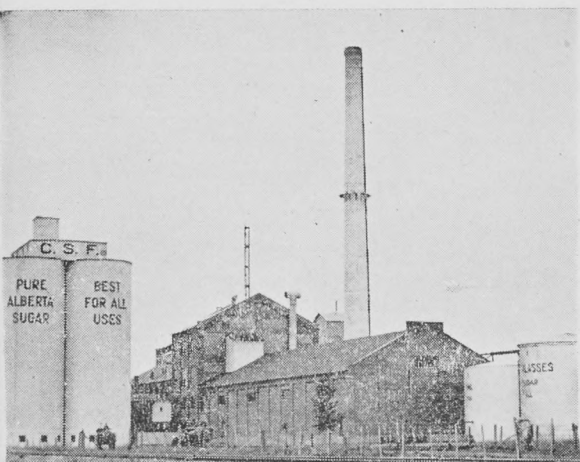
Boiler Fans.

SUGAR AS A FOOD

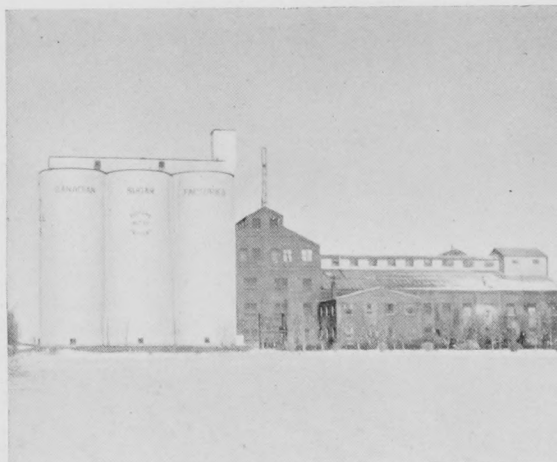
Everything we do in this world requires energy. We use energy every time we catch a ball, write a word, or take a stroke with our skates. Of course we can't be very happy and healthy if we haven't enough energy to go around. One of the easiest ways to obtain energy is by eating food that is rich in sugar. Sugar is easily digested and is burned directly by the body for quick and living energy. If **YOU** want to be full of pep, why not try using more of the food that is made of sun, air, and water, by the queen of plants—the sugar beet? You can get more pep from a dollar's worth of sugar that you can from almost anything else. Sugar is the foundation of all life. We are completely dependent on plants, for food, because of all living organisms they alone have the power to make sugar from simple elements—oxygen, carbon and water. Every compound made in a plant and later used by animals, is derived from the sugars produced by photo synthesis of the plant.

Statement of C. O. Townsend, Pathologist in charge of Sugar Beet Investigation, U. S. Department of Agriculture

"I will say, however, that Beet Sugar is always the same in composition, whether it is made in Utah, or in any other state, or in any other country. Furthermore, Beet Sugar has exactly the same composition as sugar made from cane, when properly refined.



Factory at Raymond.



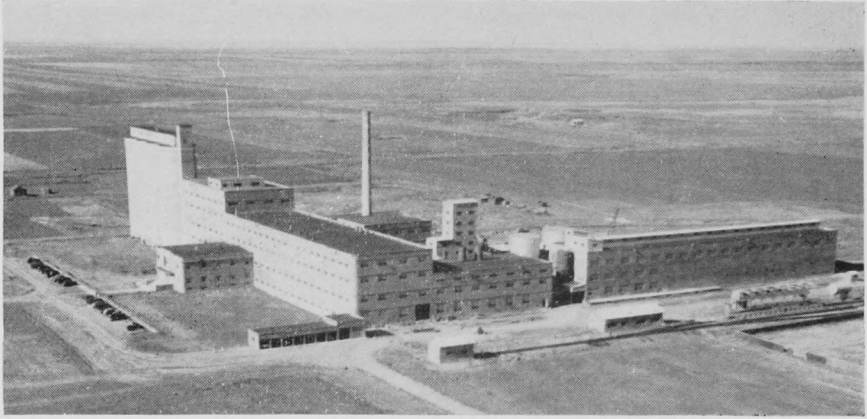
Factory at Picture Butte.

"The analysis or composition of sugar from beets or from cane is as follows: 12 parts carbon; 22 parts hydrogen; 11 parts oxygen. When these three elements are combined in the proportions indicated, the resulting compound is Sucrose, or cane sugar; cane sugar in this instance being used in trade to indicate all sugar of this composition."

CANADIAN SUGAR FACTORIES LTD., IN ALBERTA

The first factory that was built by this company was in 1925, at Raymond, Alberta. Hundreds of men are employed in each factory, and thousands are engaged in work that resulted from its opening. Every acre of beets requires lots of care, and many workers are employed by the farmers to help them raise the beets. The amount of coal and coke that is used by the plants is enormous, and it is all bought in Western Canada. So is the limestone and all supplies needed for the chemical processes. A second factory was built in 1936 at Picture Butte, Alberta. Construction of a new and most modern plant at Taber, Alberta, was completed and operations started in 1950. Taber Factory will transform 1,800 tons of Sugar Beets daily into top quality sugar. You can see, then, how many men are given work. So the sugar beet and Pure Alberta Sugar are doing their part toward making our country self-sufficient, happy and wealthy.

During each year over 1,600 farmers use 37,000 acres of land, employ 3,500 beet workers, teams, trucks and their own labor to produce over 400,000 tons of sugar beets. Then the factories, which employ over 900 men during the busy season of harvest, storage and manufacture, transform these beets at a speed of 5,000 tons daily into over 120,000,000 lbs of sugar to be used in Western Canada.



Factory at Taber

DO YOU KNOW?

- That no one can tell the difference between pure sugars if made from sugar cane or sugar beet.
- That Pure Alberta Sugar is over 99.9 per cent pure Sucrose.
- That over 120,000,000 lbs of sugar a year are made by the beet sugar industry of Alberta.
- That 60,000 lambs and 25,000 head of cattle are fattened each year on Beet Pulp, Dried Molasses Beet Pulp and Betalasses, the by-products of Alberta sugar beets.
- That Alberta farmers receive around \$8,000,000 for sugar beets yearly; Alberta factory workers receive \$900,000 yearly; railways over \$775,000 yearly; mines and quarries \$250,000 yearly; other Alberta factories \$250,000 yearly, all from the Sugar Beet — *the most educated vegetable in the world!*

CANADIAN SUGAR FACTORIES LTD.

Raymond - Picture Butte - Taber, Alberta.

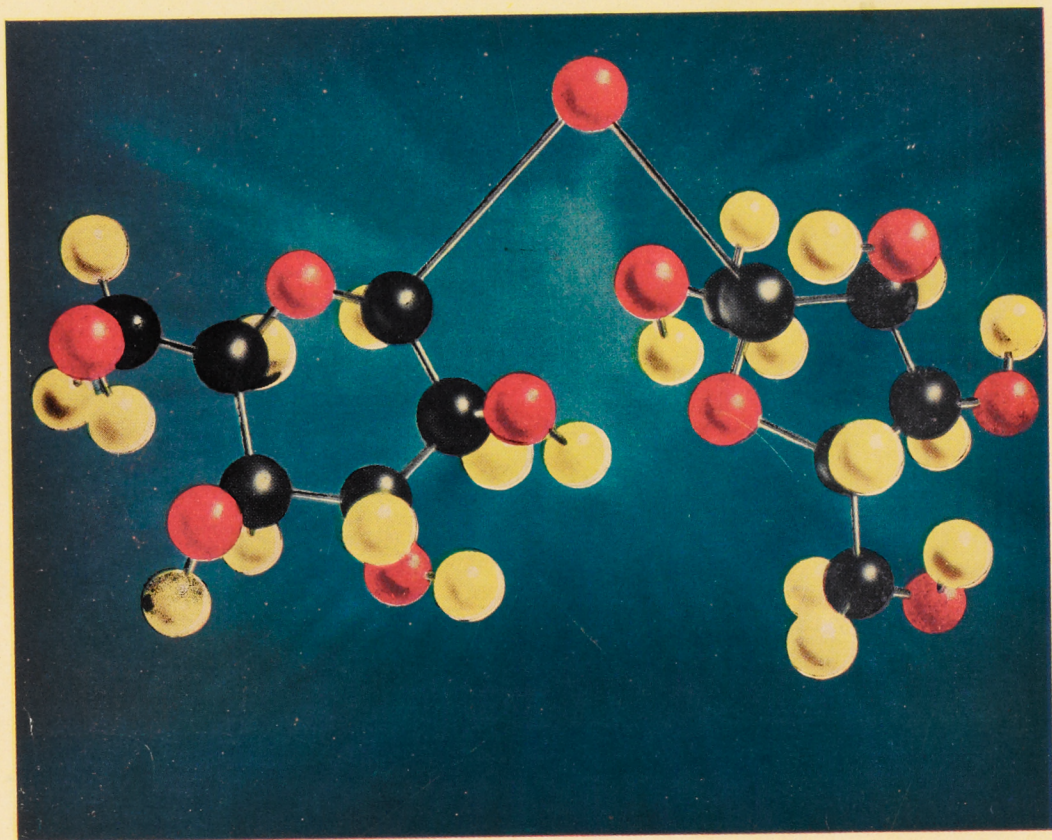
THE SUGAR MOLECULE

Diagram

Contains these Atomic Elements:

Carbon.....C 12-Black
Hydrogen.....H 22-Yellow
Oxygen.....O 11-Red

Circles with 4 Bonds
Circles with 1 Bond
Circles with 2 Bonds



Atoms are the building blocks of the molecule. Their bonds build each substance by a definite pattern. The sugar pattern is a double ring of simple sugars, dextrose and fructose, held by the top oxygen atom, and so formed in nature by sunlight and water through living plants.

The smallest sugar crystal visible contains millions of molecules.

THEY ARE ALL

PURE ALBERTA SUGAR

CANADIAN SUGAR FACTORIES LTD.

RAYMOND - ALBERTA